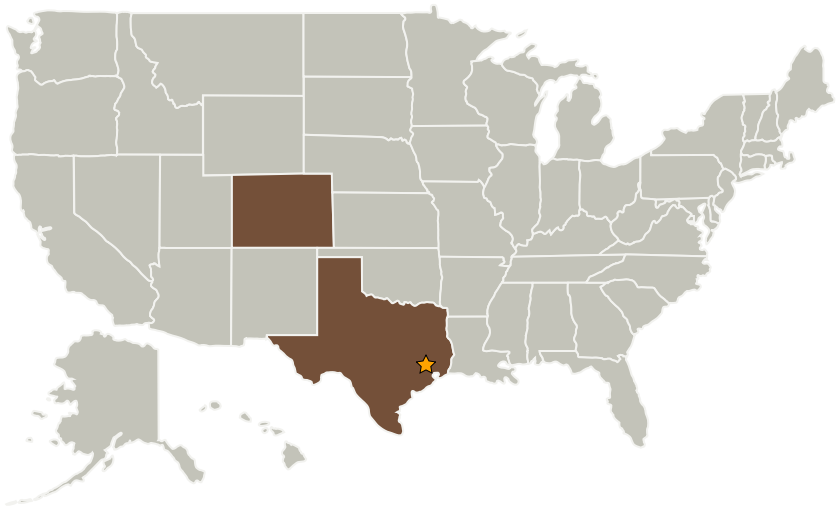
Carbon Monoxide Silicate Reduction System, Phase II

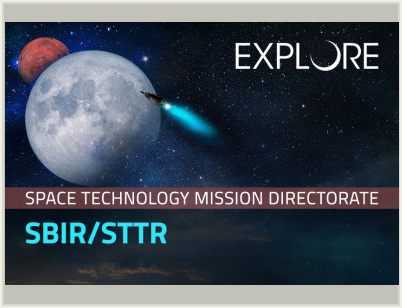
Completed Technology Project (2006 - 2007)

Project Introduction

The Carbon Monoxide Silicate Reduction System (COSRS) is a novel technology for producing large quantities of oxygen on the Moon. Oxygen yields of 15 kilograms per 100 kilograms of feed soil were demonstrated during Phase I using both lunar and Mars soil simulants. This is about five times the oxygen yield achievable by hydrogen reduction. Up to 30 kilograms of oxygen per 100 kilograms of feed soil are recoverable by adjustment of the carbon-silicon ratio. Soils are sequentially subjected to iron oxide reduction by carbon monoxide, in-situ deposition of carbon throughout the soil by carbon monoxide disproportionation, and finally high-temperature carbothermal reduction of silicates by the deposited carbon. COSRS operates in a closed system. An inventory of carbon is maintained in the form of carbon monoxide, carbon dioxide, and solid carbon. Most of the oxygen recovered from soil is in the form of carbon monoxide, which is converted to carbon dioxide. Carbon dioxide is then reacted with hydrogen in a reverse water gas shift reactor. The RWGS system regenerates carbon monoxide for use in the COSRS process and produces water, which is electrolyzed. Hydrogen from electrolysis is recycled within the RWGS system. Oxygen from electrolysis is the COSRS product.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Pioneer Astronautics	Supporting Organization	Industry Historically Underutilized Business Zones (HUBZones)	Lakewood, Colorado

Primary U.S. Work Locations	
Colorado	Texas

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
    - TX06.1.1 Atmosphere Revitalization